**3GPP TSG-SA WG6 Meeting #60 S6-24xxxx**

**Changsha, China, 15th – 19th April 2024 (revision of S6-24xxxx)**

**Source: Ericsson**

**Title: Pseudo-CR on deployment scenarios for MC services over non-terrestrial network**

**Spec: 3GPP TR 23.700-01 v 0.2.0**

**Agenda item: 8.6**

**Document for: Approval**

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**1. Introduction**

This pCR provides a solution mapped to KI#4 related to MC services over satellite access. This pCR describes the different deployment options available for MC services support over non-terrestrial network. Furthermore, it provides a brief overview of the characteristics of the different satellite systems and the architecture scenarios of non-terrestrial networks for supporting MC services.

**2. Reason for Change**

This pCR addresses KI#1 to understand the different deployment scenarios for MC services over non-terrestrial network.

**3. Conclusions**

<Conclusion part (optional)>

**4. Proposal**

It is proposed to agree the following changes to 3GPP TR 23.700-01 v 0.2.0

\* \* \* First Change \* \* \* \*

### 7.1.x Solution #x: Deployment scenarios for MC services over satellite access

#### 7.1.x.1 Solution description

This solution maps to KI# 4 related to deployment scenarios for MC services over satellite access. This solution describes the scenarios where non-terrestrial network can be utilized by MC systems, e.g., to provide larger coverage. Clause 7.1.x.1 describes the different available satellite systems, and clause 7.1.x.2 describes the architecture scenarios supporting MC systems.

#### 7.1.x.2 Non-terrestrial deployment scenarios to support MC services

Satellite systems or deployment can be divided into two categories with respect to its altitude: Geostationary Equatorial Orbit (GEO), and Non-Geostationary Equatorial Orbit. GEO is orbiting at highest altitude comparing to non-GEO, e.g., orbiting at 35786 km altitude in the equatorial plan, where its position can be considered fixed with respect to the earth, i.e., large coverage via one satellite system.

The non-GEO satellite comprises of two constellations: Low Earth Orbit (LEO), and Medium Earth Orbit (MEO). The LEO can be at altitude between 600 – 1500 km, and MEO at 10000 km.

Satellite systems of relatively low altitude, e.g., LEO, can offer relatively lower latency, lower path loss, which can be an attractive choice for latency sensitive and non-tolerable services. However, the satellite beams are moving relatively faster than the beams of GEO. Therefore, it is necessary to have a constellation of several non-GEO satellites associated with handover mechanisms to ensure proper service continuity over the non-terrestrial networks. This results in having the same cell being covered by different beams and different non-GEO satellites over time.

Information related to the characteristics of the different satellite systems, such as propagation delay, path loss, etc., can be found in 3GPP TER 33.811 [38.811]. Such characteristics and details are needed to be considered when considering the satellite system (or constellation) for MC services deployment.

#### 7.1.x.3 Non-terrestrial network architecture scenarios to support MC services

This clause describes the possible architecture scenarios where satellite access can support MC services.

In addition to the existing components to support MC services over terrestrial networks, the following new components emerge when utilizing non-terrestrial networks for MC services:

- Service link is the radio link between the MC service UE and the non-terrestrial network (the satellite under consideration).

- Satellite gateway (or non-terrestrial network gateway) is the gateway at the ground which connects the non-terrestrial network payload to the 5G system (i.e., to the gNB).

- Feeder link is the radio link between the non-terrestrial network (in specific the satellite under consideration) and the satellite gateway.

- Inter-satellite link is the direct communication link between multiple satellite within the non-terrestrial network, which is responsible of transmitting the non-terrestrial payload.

Figure 7.1.x.3-1 illustrates the MC service UE can be connected to a satellite via a service link, to which the latter is connected to the 5G system (and MC system) via a satellite gateway at the ground. The satellite can also be connected to multiple other satellites via inter-satellite link towards the satellite gateway at the ground, as described in Figure 7.1.x.3-2.



Figure 7.1.x.3-1: MCx UE is connected to one satellite via service link



Figure 7.1.x.3-2: MCx UE is connected to multiple satellites

Similarly, a remote MC service UE can be connected to a UE-to-network relay MC service UE, where the latter can utilize either a single or multiple satellites to achieve connectivity to the 5G system (and the MC system) as illustrated in Figure 7.1.x.3-3 and Figure 7.1.x.3-4.



Figure 7.1.x.3-3: A remote MCx UE is connected to one satellite via an UE-to-network relay MCx UE



Figure 7.1.x.3-4: A remote MCx UE is connected to multiple satellite via a UE-to-network relay MCx UE

#### 7.1.x.2 Architecture Impacts

Editor's note: This clause provides the architecture impacts (if any) of the solution and possible new SA6 capabilities and interfaces.

#### 7.1.x.4 Solution evaluation

This solution provides an overview of the different deployment to support MC services over satellite, it takes into account the characteristics of the different satellite systems in selecting the suitable satellite system for MC services deployment.

Furthermore, the solution describes the architecture scenario of utilizing satellite access for MC services, including a remote MC service UE obtaining MC services via UE-to-network relay MC service UE, where the latter is connected to the 5G system (and MC system) via satellite access.

\* \* \* Next Change \* \* \* \*

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 22.261: "Service requirements for the 5G system; Stage 1".

[3] 3GPP TR 22.822: "Study on using satellite access in 5G; Stage 1".

[4] 3GPP TR 22.865: "Study on satellite access - Phase 3".

[5] 3GPP TS 23.501: "System Architecture for the 5G System; Stage 2".

[6] 3GPP TS 23.502: "Procedures for the 5G system, Stage 2".

[7] 3GPP TS 23.503: "Policy and Charging Control Framework for the 5G System".

[8] 3GPP TS 23.401: "General Packet Radio Service (GPRS) enhancements for Evolved Universal Terrestrial Radio Access Network (E-UTRAN) access".

[9] 3GPP TS 23.682: "Architecture enhancements to facilitate communications with packet data networks and applications"

[10] 3GPP TS 23.558: "Architecture for enabling Edge Applications"

[38.811] 3GPP TR 38.811: "Study on New Radio (NR) to support non-terrestrial networks"

\* \* \* End of Changes \* \* \* \*